Comments on

ENVIRONMENTAL TOBACCO SMOKE: A GUIDE TO WORKPLACE SMOKING POLICIES

[Draft] EPA 450/6-90/004

Chapter 1: What Is ETS?

Toxins and Irritants

Carbon Monoxide (CO)

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SUMMARY

The statements made about carbon monoxide (CO) from ETS are imprecise and inordinately brief and therefore are misleading. These statements will provide decision-makers with a false understanding of the effects of CO exposure from ETS. Major problems with the Guides discussion of CO from ETS include: (a) neglect of toxicological principles and (b) failure to recognize that exposures are neither analytically nor biologically significant.

Specific comments are provided below.

ITEM 1. The Guide states on p.9 under **Toxins and Irritants:**

> In addition to its carcinogenic constituents, ETS contains a variety of other chemicals that are harmful to humans. Examples include:
>
> **Carbon monoxide** is a gas that interferes with the ability of the blood to carry oxygen. Carbon monoxide levels increase when smokers are present, adding to the body burden of carbon monoxide from other environmental sources.

COMMENTS

1. **Neglect of toxicological principles** The introductory paragraph implies that because CO, hydrogen cyanide, ammonia, and nicotine are present in ETS and because these substances above certain exposure levels *can* be harmful to humans, humans are therefore harmed by exposure to these substances when found at extremely low levels in ETS. This logic is flawed because of the authors' failure to recognize fundamental toxicological principles. Put

simply, there is no evidence that CO from ETS either has harmed or could possibly harm humans at *realistic* ETS concentrations. Realistic ETS concentrations are emphasized here, to distinguish data that can be applied to the workplace from data reported in studies where concentrations of ETS were unrealistically high.

2. **Relative insignificance of exposure** In almost all settings where exposure of the public to ETS can occur, exposure to CO from ETS is insignificant relative to CO exposures originating from other sources. In general, automobiles are *the* major source of CO measured both indoors and outdoors, a fact which is reflected by the need to measure CO both indoors and outdoors to characterize its effect on indoor air quality accurately. Other sources, far more important than ETS, include gas-fired appliances and space heaters.

3. **Significance of increase in CO levels with smokers** The statement "Carbon monoxide levels increase when smokers are present" is misleading and to some extent inaccurate. It implies that whenever smokers are present, a measurable, and therefore analytically significant, increase in the CO level occurs. The scientific literature supports neither the statement nor its implication.

Field surveys to assess ETS exposure show that CO concentrations do not correlate significantly with smoking activity. (See, for example, Carson and Erikson [1].) Most scientists engaged in exposure assessment recognize that the utility of CO as an indicator of ETS exposure is limited essentially to laboratory settings because of the general inaccessibility in field settings of representative locations for collecting outdoor samples. (Aircraft cabins are an exception because outdoor CO does not contribute significantly to indoor CO concentrations.) As noted above, the literature shows that most, if not all,

of these experiments in laboratory settings involved unrealistically high levels of smoke – concentrations much higher than would be associated with ETS.

4. **Meager data base on exposure to CO from ETS** The literature contains very few studies which attempt to quantify exposure to CO from ETS. To quantify such exposure accurately requires measurements both inside and outside of the environments studied – an apportionment procedure which allows estimation of the contribution of outdoor sources of CO to levels of CO observed indoors. Because ETS is a minor source of CO and because CO is not specific for ETS, estimates of exposure to CO from ETS in field settings are imprecise. For this reason, most scientists engaged in exposure assessment do not view CO as a reliable (or even a useful) indicator of exposure to ETS.

5. **Biological significance of exposure** The passage also implies that both exposure to CO from ETS and the consequent body burden of CO from ETS are biologically significant: no evidence exists to support either of these implications. Indeed, the literature is replete with conclusions that carboxyhemoglobin is not an adequate indicator of exposure to ETS.

The National Research Council [2] addressed this issue:

> "In sum, however, measurements of exhaled CO and of [carboxyhemoglobin] are not useful indicators of exposure to ambient ETS except in acute exposure studies in the laboratory."

6. **Exposure in Relation to Standards** The CO levels found in most environmental settings are substantially lower than the EPA National Ambient Air Quality Standard (NAAQS) and the National Institute of Occupational

Safety and Health (NIOSH) standard. If, for sake of argument, one accepts the EPA's stated and implied positions, namely, that CO from ETS is:

(a) harmful to humans;
(b) interferes with the ability of the blood to carry oxygen;
(c) adds to the body burden of carboxyhemoglobin; and, therefore,
(d) is biologically significant under realistic conditions of exposure,

then the level of the primary NAAQS for CO must be inadequate; consequently, the standard should be revised. This author is unaware of any science suggesting the inadequacy of the current NAAQS.

The Guide is inconsistent on the matter of citing standards; e.g., on p. 12, standards are invoked to address results from determinations of ETS RSP in homes. Why is it that the Guide does not use standards in connection with the brief discussion of CO from ETS?

7. **Absence of literature citations** Literature citations to support the statements in this paragraph would be helpful and would enhance technical quality by ensuring completeness.

RECOMMENDATION

The EPA must either strike the paragraph on CO or include all of the following: (a) provide an average CO exposure for environmental categories of interest to the intended users; (b) put exposure to CO from ETS in perspective by giving average ambient levels associated with either urban settings or EPA or NIOSH standards; and (c) note that neither CO nor carboxyhemoglobin is a reliable indicator of ETS exposure.

LITERATURE CITED

1. Carson, J.R., Erikson, C.A., "Results from a Survey of Environmental Tobacco Smoke in Offices in Ottawa, Ontario," *Environ. Technol. Lett.*, **2**, 501-508 (1988)

2. National Research Council, *Environmental Tobacco Smoke*, National Academy Press, Washington, DC, 1986, p. 137.